Chapter Five

Evaluating Packages of TDM Strategies

The comparison and evaluation of TDM alternatives can include a number of different criteria and factors. ISTEA's required assessment, FTA Guidelines, FHWA directions and EIS processes put forth a large number of impacts and performance criteria that should be included in the investment study process. Ultimately, TDM alternatives must be assessed on the evaluative criteria chosen by the stakeholders and decision-makers for the each individual study.

Methods for Measuring Effectiveness of Individual TDM Strategies

Measuring the effectiveness of individual TDM strategies is difficult and has not necessarily been a high priority in the past, although this is beginning to change with the increased interest in TDM. The following is intended to give a general sense of how the effectiveness of individual TDM strategies can be, and have been, measured. For more specific information on the effectiveness of individual strategies gathered from extensive research, refer to Table 5.1 and to the detailed documentation of strategies in Appendix I.

The Washington State Transportation Center (TRAC) at the University of Washington recently identified three general approaches that are being utilized to evaluate the impact of TDM (Research Project # T9223, Task 10). In gathering data for this guide, we used all three. They are:

Case Studies

TRAC found these to be particularly effective for analyzing employer-based, site specific TDM strategies, and that they can provide the basis for projecting broader impacts (this is primarily because most TDM to date has been directed at commute trips).

Best Estimates

This approach starts with assumptions that, when used in the traditional four-step modeling process (trip generation, trip distribution, mode split, and trip assignment) TDM can either be reflected in the trip generation step (reduced number of person trips) or in the mode split step (reduced number of vehicle trips or VMT). This approach does not evaluate the effects of TDM strategies, so much as it evaluates a transportation network with a theoretical reduced demand.

Models

Models attempt to estimate changes in behavior based on data collected in past TDM applications. TRAC identified two models (COMSIS and JHK & Associates), the latter of which focuses on employer-based TDM strategies — again, because those strategies are the ones most widely implemented and evaluated.

Recommended Evaluation Criteria for TDM Strategies

Table 5.1 presents a matrix of evaluation criteria specific to demand management strategies. The criteria incorporated into this table are considered key to assessing the differences in performance and acceptability among TDM measures. Like Table 1.1 which presented characteristics of the strategies, this table provides a simple summary of differences among the categories and individual strategies. The enhanced summaries presented in Appendix I provide much more specific information. Table 5.1 provides concise information on the following evaluation criteria, for each of the selected TDM strategies:

Potential Effectiveness

Indicates the demonstrated (or modeled) effectiveness for each strategy. Generally this is provided as a range of potential changes in VMT (vehicle miles traveled) or in trip reduction. Where the potential change has not been demonstrated the effectiveness is classified as "unknown."

Implementation Difficulties

Provides a qualitative indication of known or anticipated difficulties — financial, political, and public. Although some difficulties relate to technological developments, most are attributed to resistance to change and the acceptance of more radical policies.

Incremental Cost

Provides a general indication of the level of costs anticipated to implement a strategy. Costs will vary tremendously based on the area of application and the size of the program or service implemented. Consequently, only a qualitative assessment of costs is provided in the matrix. Costs are labeled as being of low, medium or high levels.

Who Pays

Indicates which parties are likely to bear the burden of the costs associated with the strategy. This matrix illustrates the group or groups that would *traditionally* pay for the strategy. It is important to remember when using this chart that a demand management program may propose a new financing source. Eventually, with changes to the state's priority programming process, highway funds may be made available to cover the softer TDM program and service costs (including operating costs) over a long period of time — as an alternative to the highway capital investment.

Comments on the Evaluation of TDM Strategies

A number of concerns and cautions should be acknowledged relative to evaluating demand management strategies and programs. These are:

Data and Forecasting Issues

Problems inherent in modeling and forecasting should be well known to those involved in environmental impact analysis. Those issues are even more complex when it comes to demand management strategies. As noted earlier, TDM is still a fairly

young discipline. We have yet to collect all the needed data, fully document potential effectiveness and develop reliable forecasting tools (this information is especially lacking for non-commute trips). It is important, therefore, that the information provided in this guide — particularly relative to effectiveness — be treated with a degree of caution.

Multiplier Effects and Combined Strategies

Even where there is reliable data on the effectiveness of individual TDM measures, there is still limited information on the combined effect resulting from a package of TDM strategies. Some strategies have no impact without the presence of other basic TDM services and techniques. Transit pass subsidies at suburban employment sites, for example, have little or no effect until sufficient transit service exists to support employee commutes (although it should be noted that many transit agencies do permit employer-subsidized transit passes to be applied to vanpool fares). At the same time, the impacts of a package of TDM strategies is not likely to be linear — and cannot be estimated by simply adding the potential effectiveness scores for each of the included measures. In fact, the cumulative effect of a combined package may be less than the sum of the parts — or, given a synergistic relationship, it may be substantially more. Examples of the former are readily apparent for employer programs. An increase in telecommuting, for example, may take place among the low and mid-level management commuters who already utilize incentives to ride the bus or vanpool to work. The increased utilization of one mode may come at the expense of another HOV mode. An example of the latter, where a multiplier effect results in unanticipated impacts, has been seen with the addition of HOV supporting measures, including guaranteed ride home programs, which generate significant increases in the use of other TDM programs and in a larger HOV shift than the individual strategies would typically generate alone.

Timing

In the implementation of demand management activities, timing presents two important considerations. First, TDM can effectively delay more costly capital expenditures. The introduction of TDM programs, for example, may be used to postpone a needed infrastructure expansion for a decade or more. Planners are encouraged to consider the inclusion of demand management activities as part of an integrated package of TDM and capital expenditures over a twenty year construction time frame. Second, most TDM strategies are market intervention measures. Because they are designed to meet current market conditions they may gain or lose effectiveness over time and with changes in the larger environments. With advancing technologies and a changing political scene planners may need to identify potential trip reduction from TDM measures without permanent commitment to specific techniques, while providing sufficient funds to cover a range of potential strategies over a twenty year period.

Travel Demand Models

Often, a fairly high level of projected trip reduction resulting from TDM is incorporated into models. Commonly, the achievement of a specific level of trip reduction is just assumed to happen over time, due to actions that are usually unspecified. It is suggested that planners examine the assumptions of the models that they are relying on for trip forecasting. This review can serve as a reality check on the trip reduction already incorporated into the model and attributed to TDM activities. It will also prevent the planner from generating a TDM alternative that is largely based on programs and trip reductions that have already been assumed. This also may mean that some of the impacts of the assumed TDM will have to be attributed to the TDM alternative being developed, even before the new impacts of the alternative can be counted.

Relative to models, the following cautionary advice is offered in *"The Use and Evaluation of Transportation Control Measures,"* a study completed by the Texas Transportation Institute, in cooperation with the FHWA and the Texas DOT (Transportation Control Measures - TCMs - are transportation strategies that can be implemented to reduce air pollution, many of which are also TDM strategies):

> *"Regional travel demand models can also make large errors in estimating traffic volumes and speeds on individual network links. It is common for even the best procedures to make errors of over 30% in link volumes and over 50% in speeds. The magnitude of these errors by themselves greatly exceed the magnitude of travel impacts of most TCMs*."

> *"...travel demand models are not equipped to predict shifts in demand due to employer-based transportation management programs, and similar programs initiated by the local government. Only those activities that alter the modal availability or change the time and cost of a travel mode uniformly across all the users is a particular class (e.g., all service employees) can be evaluated using the regional travel demand models."*

> *"Sketch-planning is gross in nature, but also the most promising and cost-effective of the TCM evaluation methods currently available."*

The approach recommended in this guide is essentially a sketch planning approach. In the area of evaluating packages of strategies and developing final recommendations, it is particularly valuable to be working with a team from the community whose members are knowledgeable in TDM. As noted several times, evaluating TDM is not an exact science. A common-sense approach that utilizes the best available knowledge is needed.

Table 5.1

Evaluation of TDM Strategies

				Who Pays			
	Potential Effectiveness	Implementation Difficulties	Cost	Taxpayers	Users	Private Sector	Public Sector
Alternative Mode Support Strategies							
Public Education and Promotion	0-3% more HOV use at worksites (*Comsis*), potential for more during targeted campaigns or short term actions	none	low - medium	X		X	X
Area-Wide Ridematching Services	0.1 - 3.6% regional VMT reduction (*PSRC*), 20% trip reduction at individual worksites (*Comsis*)	critical mass of participants necessary; privacy/safety concerns	low - medium			X	X
Transit Services	up to 5% regional VMT reduction (*PSRC*)	ongoing competition for public funds, catch-22 of service expansion	medium - high	X	X	X	X
Vanpool Services	currently, vanpools in the Puget Sound Region make up 2% of all commute trips, eliminate over 11,000 vehicles daily, and reduce the yearly regional VMT by 2.7 million miles (*Vanpool Market Study*).	higher fares than transit; finding drivers, keeping up with demand	medium		X	X	X
Custom Transit Services	effectiveness largely undocumented	need for careful market research and good publicity	medium	X	X	X	X
Non-Motorized Mode Support	0 - .2% regional VMT reduction (*PSRC*), 1% increase in walk mode share = 0.5% decrease in commute trips; 1% increase in bike mode share = 0.9% decrease in commute trips (*Comsis*)	minimal for low cost actions; high cost actions more difficult to get funding	low-medium	X			X
HOV Facilities	2-10% reduction in peak-period trips on congested facilities, trip reductions from 2-20% (*Comsis*), 1.5% reduction in daily VMT (*Apogee*). Can save travelers up to 171 seconds/mile in the Puget Sound Region (*WSDOT*)	high cost; political support	high	X			X
Park & Ride Lots	0 - 0.5% regional VMT reduction, 50% VMT reduction for individuals (*ECO Northwest*)	zoning restrictions	medium - high	X			X
Carsharing	40 - 60% decrease in individual VMT	convenience, not as applicable in suburban areas	low		X		

Table 5.1

Evaluation of TDM Strategies

	Potential Effectiveness	Implementation Difficulties	Cost	Taxpayers	Users	Private Sector	Public Sector
Worksite-Based Strategies							
Monetary Incentives	8 - 24% trip reduction at site (*various sources*), 1-3% regional VMT reduction (*PSRC*)	tax implications for some subsidies	low - medium			X	
Alternative Work Schedules and Sites	0-1% regional VMT reduction (*PSRC*), 15% total trip reduction (*Comsis*)	management reluctance	low			X	
Guaranteed Ride Home	can entice 2-5% of commuters to try alternative modes (*Comsis*)	liability concerns of employers	low		X	X	X
Parking Management	20 - 30% reduction in SOV trips at individual worksites (*Comsis*)	employee opposition	low to revenue producing		X	X	
Facility Amenities	similar to effects of mixed-use development	space and possibly cost; local zoning requirements	low to revenue producing			X	
Transportation Management Associations	5 - 7% commute trip reduction, a few over 10% reduction (*SCAG*)	funding and political support required	low - medium			X	X
Land Use Strategies							
Compact Residential Development	20% decrease in SOV mode split at around 12 du/ac (*various sources*)	public resistance; low existing densities in the Puget Sound Region	low-medium		X	X	X
Employment and Activity Centers	50 employees/acre necessary for significant switch to transit, 125 employees/acre increases transit's mode share to over 50% of all trips (*Frank and Pivo, Cervero*)	large increase in density often necessary from existing conditions	low-high		X	X	X
Mixed Land Uses	VMT reductions up to around 10% (*LUTRAQ, PSRC*)	public resistance; inflexible regulations	low to medium		X	X	X
Connectivity	increase pedestrian activity an average of 3 times (*Moudon*), decrease in VMT unclear	right-of-way acquisition costly; local opposition	medium	X	X	X	X
Transit/Pedestrian Friendly Urban Design	increases in pedestrian friendliness can triple combined share of transit, walking, and bicycling and decrease VMT 10% (*LUTRAQ Volume 4B*)	Possible resistance from developers and Fire/EMT personnel	low-medium	X	X	X	X
Parking Management	Reduction in vehicle trips by 1-5%, 25-50% transit increase in cities with strong programs (*various sources*)	local council action required; public/retailer resistance; enforcement issues	low		X	X	

Table 5.1
Evaluation of TDM Strategies

				Who Pays			
	Potential Effectiveness	Implementation Difficulties	Cost	Taxpayers	Users	Private Sector	Public Sector
Jobs/Housing Balance	30% shorter work trips	changes in social/work patterns/trends	low	X	X	X	X
Affordable Housing	effects similar to jobs/housing balance	Fiscal zoning, no regional standards	low-medium	X		X	X
Development Impact Mitigation	varies with mitigation requirements	landowner/developer resistance	low to medium		X	X	
Public Policy & Regulatory Strategies							
Trip Reduction Ordinances	.1 - 4% regional VMT reduction, 8% decrease in SOV mode split at worksites (*CTR*)	legislative action required; resistance to expanded regulation	low - medium	X		X	X
Access Priority/Restriction	2.8 - 10% VMT reduction	political will to face public opposition	low - high	X		X	X
Support of New Institutional Relationships	little documentation; 5-10% VMT reduction from TMAs	require strong advocacy, public & private sector support	low - high	X		X	
Telecommunications Strategies							
Information Services	little documentation; mainly in the demonstration stage	programs are new and untested	low - medium	X	X	X	X
Internet-Based Strategies (teleshopping)	little documentation; potential to affect nonwork trips	little documentation, most programs private businesses	low - revenue producing	X	X	X	X
Telecommuting (telework)	individual VMT decrease of 60% per telecommute day; potential 5-10% regionwide VMT reduction *(PSRC)*	job duties that require employees to be on-site (i.e., manufacturing)	low			X	
Pricing Strategies							
Parking Pricing	1 - 5% regional VMT and trip reduction (*ECO Northwest*), 12-25% SOV reduction at individual worksites (*Comsis*)	negative public sentiment opposition from private sector, equity issues unless transit improvements are made, spillover parking	revenue producing		X		
Gas Tax Increase	4 - 10% regional VMT reduction, depending on the tax (*various sources*)	public resistance; travel alternatives necessary to avoid regressivity	revenue producing		X		
Road/Congestion Pricing	up to 5% regional VMT reduction (*PSRC*), other studies estimate 10-50% reductions (*various sources*)	public resistance; travel alternatives necessary to avoid regressivity	revenue producing		X		
VMT Tax	around 11% regional VMT reduction with a $0.05 per mile charge (*PSRC*)	public resistance; travel alternatives required to avoid regressivity	revenue producing		X		
Transit/Vanpool Fare Subsidies	1.8-2% regional VMT reduction (*PSRC*)	competition for public funds; equity concerns	medium	X		X	X

Chapter Six

Recommendations For Further Work

Throughout the state of Washington and the rest of the country, planners and policy-makers are struggling to complete comprehensive planning efforts and to promote a more even-handed comparison of alternative solutions to transportation problems. Whether this is attributable to feederal mandate, the need to secure low cost alternatives, or the public outcry against aggressive highway expansion is irrelevant. We continue to search for creative approaches to road and highway congestion and demand that quickly outstrips supply. TDM holds the promise of providing lower cost, market-based solutions that can be accomplished without large expenditures of capital.

Preparation of this guide has been an effective reminder that we fall far short in providing adequate data and appropriate guidance for incorporating TDM strategies into a competitive study and funding process. Large gaps in needed information, the absence of technical analysis and technical expertise, and policy and process barriers all make it difficult to fully include TDM in planning efforts. The following discussion enumerates the authors' recommendations for further work in this area.

Gaps in TDM Knowledge and Information

Our efforts have been hampered by the lack of basic data about some demand management alternatives and their impacts on travel behavior. We've identified the need for additional inquiries about the following:

Non-commute Trips

Non-commute trips constitute 75-80% of the typical household's travel. We know little about the characteristics of non-commute travel; we know much less about the potential TDM strategies for changing that travel behavior. There is some indication that land use strategies can be most effective in reducing noncommute trips, according to results of several recent studies. However, most land use alterations are long term changes which are difficult to evaluate or model.

Market Segmentation

We are beginning to acquire the needed trip data to develop reasonably adequate trip models for highway utilization, at least on a regional and near-term basis. We still lack basic data, and applied demonstrations, for identifying the elasticity of mode choice, especially how it differs between commute and non-commute trips.

Employer TDM Activities

Employer TDM Activities have been well documented only at the individual

work site level, due to Washington State's Commute Trip Reduction Law. There is, however, a need for added study of the effects of employer-based strategies at the area, regional, and corridor level and a better understanding of the real cost impacts on the business community.

Combinations of TDM Strategies

There is little documentation on interactive impacts, multiplier effects and optimal combinations of demand management activities in different situations.

Technical Research Needed

Beyond the basic generation of data and information, there is a need for new tools and methodologies for incorporating knowledge into alternatives analysis. We recommend further technical research and new methodology for:

Improved Forecasting of the Impact of Demand Management Activities

We need to address the long term effectiveness of strategies and techniques that have, to date, been observed only in relatively short term applications.

Projecting Effectiveness of TDM Measures and Techniques

For the most part, only employer-based programs and vanpooling have been addressed by researchers. To expand the body of knowledge we need to undertake applied demonstrations and specific efforts to document and evaluate non-commute strategies.

Cost/Benefit Analysis

Cost effectiveness, life cycle cost analysis, and least cost planning are key components of EISs and the state's programming and financing processes. TDM actions are difficult to assess in these evaluative processes — but, so are more traditional transportation projects. As noted in the introduction, considering the full societal cost of any transportation alternative is virtually not done outside, perhaps, of academia. Planners, however, are being increasingly pushed in that direction. The lack of methodologies to do such all inclusive comparison severely hampers our ability to define TDM alternatives and to compare them to other solutions.

Including TDM Measures in Travel and Trip Modeling

Modeling has significantly advanced during the past decade, especially at a regional and near-term level. Its remaining shortcomings, however, present clear barriers and disincentives to including TDM measures. Models are generally vehicle-based (as opposed to trip or person-based) and they are unable to acknowledge the key attributes and changes anticipated by demand management activities: travel time, land use, changes in departure times, trip chaining, and travel costs. Efforts are needed to ensure that the next generation of models is more responsive to TDM and to the potential market changes these measures can generate.

Estimating Latent Demand for Capacity Expansion Projects

To enable us to make more honest comparisons of alternatives to capacity expansion projects, we need to ensure that we can, and do, account for the latent trips triggered by capacity expansion.

Policy and Process Barriers

The key to the future of TDM activity may lie in changes to our planning policies and processes. An evolutionary change in planning philosophy is already underway. The next step is to create the institutional structures that will ensure a continuing focus on TDM and thereby legitimize demand strategies in a supply-oriented system. Potential changes include:

Modification of Project Criteria

This action could place a greater priority on TDM in local, regional and state decision-making processes. Revisions to the mobility prioritization criteria and the current scoring guidelines can provide the method for comparing TDM and capacity alternatives and increase the competitiveness of a demand side alternative. Currently, Regional Transportation Plans are required under the Growth Management Act to be based on a least-cost planning methodology that assesses all modes and programs for cost-effectiveness, providing one good example of how least-cost methods can be included in the decision-making process. However, the utilization of least-cost methods and others better able to include full societal costs should be broadened to other contexts throughout the state.

New Funding Priorities and Funding Parameters

Many TDM measures are programmatic and require operating dollars, and are most effective if there is some degree of flexibility in the programming. Current funding guidelines may prevent allocation to non-capital projects. Modifications, including flexible funding for TDM and the introduction of mechanisms to reserve funds for future TDM activities, may be the critical next step.

A Higher Level and Nature of Inter/Intra Agency Collaboration

Agencies that are able to work effectively together will be better equipped to integrate the planning and implementation of demand management programs. Turf issues may inhibit state planners from generating alternatives that are beyond the locus of responsibility, and resources, of the state. Solutions that require commitments from transit agencies, land use agencies, or employer stakeholders may be eliminated or restricted because of the limited areas of responsibility assumed by the participants. Existing tension could be eased if the TDM solution was more assured of funding — at least as much as the capacity solution is. Modifying the process could also occur through the provision of incentives (and disincentives) to truly collaborative proposals.